LONGEVITY OF SOME RACES OF THE HONEYBEE (*APIS MELLIFERA* L.)

BY

ABDEL-LATIF AMIN EL-DEEB

B.S., Fouad I University, 1937
M.S., University of Illinois, 1951

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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R. UNIV. BIBLIOTHEEK LEIDEN

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Introduction

The comparative study of the longevity of different races of the honeybee (*Apis mellifera* L.) is of great value to the beekeepers. During an unexpected short honeyflow, one is more likely to have harvesters available with long-lived than with short-lived races and strains. Since the older bees give their whole attention to the collection of nectar and pollen, a week or two added to the life of each forager would mean that more surplus honey would be gathered during the honeyflow periods, for the extra time would be devoted entirely to increase the stores of honey. A colony of longer-lived bees should maintain the strength of the colony with less brood rearing than would be required in a colony of shorter-lived bees.

Methods and Materials

This comparative study of longevity of the races of the honeybees (*Apis mellifera* L.), beginning in 1950, included at first, only the three-banded or leather colored Italian, the Caucasian and the Carniolan races. Later the Golden Italian was included. The colonies from which the experimental bees were obtained are referred to as the parent colonies. The experimental colonies into which the marked bees were introduced, included two observation hives and three and later four full colonies, with each of the full colonies of different races. With the exception of the Carniolan colony, the parent colonies remained the same throughout all the experiments and these colonies served as the experimental full colonies into which the marked bees of all races were introduced. In 1951, three additional strains of Italians and one of Caucasian were used for a comparison with the same strains of the races already being used.

Newly emerged workers were marked with a spot on the notum with quick drying "Dupli-Color Touch Up" paint, with identifying colors and patterns. Marked workers of all races and strains being tested were introduced to each of the experimental colonies. During the spring, summer, and early fall, on a favorable day, each week, the living marked bees were counted just before sunset.

When only a few bees were left, counts were made every three days. In winter, the full colonies were moved to the greenhouse, to allow the bees to take flight, after which they were counted.

The condensed records of all the experiments, dealing with the average of longevity of the different races in all colonies, of each experiment, in the different periods of the year, are shown in table 1 figure 1. Shown for each experiment is the time period, the average of the assured age of the oldest bees of each race, and the average of all the races. Also given in table 1 are the combined averages of the survived age of all bees, in all colonies and all races of each experiment. The averages of longevity of each race and all races are given separately, for the two observation hives, only, when there were large differences between them and full colonies. The assured age of the oldest bees is considered as the period between the time of their emergence and the last counting time in which they were present. All of the first day in which the bees emerged is included in the total age. The average of the survived age of all bees is calculated by multiplying the number of bees that had disappeared at each examination by their days of age at the previous counting, then totaling these products and dividing this total by the total number of bees of the race involved. The averages in all colonies for each race separately, and for all races combined, for each experiment, respectively, are given (Table 1). The original paper contained an additional 13 tables and 52 graphs. Each table included a numerical and percentage record for each race in all the experimental colonies in a given period. Each graph depicted the comparative longevity in each colony separately.

Results

In respect to the average of the assured age of the oldest marked bees through all the experimental periods of 1950 and 1951, the data shows that the averages of longevity for the periods previous to the honeyflow, during the honeyflow, following the honeyflow, and during the winter were, respectively: for the Italians—54.2, 45.8, 68.0, and 237 days; for the Caucasians—56.8, 50.9, 73.25, and 223.3 days; for the Carniolans—61.0, 53.9, 80.1, and 208.3 days; for the Golden Italians—62.2, 58.5, 89, and 208 days. In respect to the average survived age of all bees, the marked workers lived respectively, for the Italians—26.49, 20.78, 25.62, and 109.41 days;

for the Caucasians—27.56, 23.91, 29.19, and 82.27 days; for the Carniolans—29.45, 25.73, 32.80, and 71.65 days; and for the Golden Italians—32.58, 26.38, 32.93, and 71.25 days. In the averages just stated, the longevity of the marked workers of the observation hives (Table 1) were not included in the periods following the honeyflow and the periods during the winter, where there were large differences between them and the full colonies.

Conclusions

The data shows that during the active seasons the Italian workers lived a shorter time than the Caucasian workers, and the latter less than the Carniolan workers, with the Golden Italians the longest in longevity. This order of longevity of the different races is indirectly correlated with their activities in brood rearing and honey storing in their original parent colonies. It might be that each race has an inheritent characteristic within the bees themselves, causing the bees to be much more or less active, long lived or short lived. But it is not necessarily true that the long-lived bees of any particular period of the year are more industrious and prolific. It is shown in these experiments that the Italian workers are shorter lived, both in their parent colonies and when they are introduced into other colonies of different races. On the other hand the original Italian colony of this experiment produced more surplus honey and reared more brood than the colonies of the other races. This is contrary to the fact commonly believed that the longer-lived workers produce more surplus honey. Moreover, it is shown that the workers live longer when they become less active. The Caucasian workers are second to the Italian workers; they lived longer and the parent colony raised less brood and stored less honey. In the active season, there is not much difference between the Caucasian and Carniolan workers, in respect to brood rearing and honey storing. However, the Carniolan workers lived a little longer, and the parent colony raised slightly less brood and stored a little less honey than the Caucasian. In such a comparison, the Golden Italian workers occupied the extreme opposite of the Italian workers. They lived longer and the parent colony produced less honey than the others. This substantiates the well known fact that the Golden Italians are not prolific in honey production. All

the experiments indicate that the race that shows more activities in brood rearing and honey storing, during the active season, lived a shorter time than that of the other races which were less active.

On the other hand, during the periods previous to and following the honeyflow, the life span is extended because of less strenuous activity, with all races occupying the same position relative to each other as during the honeyflow.

The length of life of the workers, including all races, emerged in September and October, was prolonged during the fall and winter months, when their activities were reduced to a minimum. In these periods, the Italian workers exceeded the other races. The Golden Italian and Carniolan workers that were leading in the longevity, in all the experiments of the active periods were exceeded also by the Caucasian workers. This may indicate that the reason for the short lives of the Italian workers during the active season is that they are more active than the other races.

It is noted that the marked workers of all races emerged on September 9, 1950, lived an average of 16.41 days longer than those that emerged on October 10, 1950. This might be due to the fact that the former workers had 31 days of reduced activities before the latter emerged, but both were then subjected to the same conditions of winter weather.

In respect to the observation hives, it is found that the marked workers decreased rapidly during the late fall and winter months. This indicates that the observation hives do not serve as an accurate test of actual longevity, but they do give a relative comparison between the races of bees. However, observation hives are satisfactory for use during the active season, since the workers, due to their limited activities in the small sized hives, live only a little longer time than those of the full colonies.

Although the marked workers of all races being tested were introduced into experimental full colonies headed by queens of the different races, no significant effect of the race of the experimental colony on the marked bees was noted. On the other hand, it is found that the strength of the colony had an influence on the longevity of the workers, without respect to the race. In the active season of 1950, it is noted that the workers lived a shorter time in strong colonies than those in weaker colonies. In the active season of 1951, when the colonies were of the same strength, no significant

difference can be noted, with the same relative position as to age of different races. In the winter of 1950-1951, it is found that the workers lived longer in strong colonies, than those in weaker colonies.

In two experiments on the comparative study of different strains, starting in June and July, 1951, marked bees of four Italian and two Caucasian strains were introduced into one colony. No significant difference was found between the four strains of Italians, nor between the two strains of Caucasians, one of each race having been used in all other experiments.

A final conclusion is that the Italian workers are shorter lived due to their intense activity of brood rearing and honey storing. If the breeders dealing with the new strains produced by queen ensemination can add more length of life to the present suitable features of the Italian race, it should be excellent in honey production. In future testing of the comparative longevity of different races and strains, the use of full colonies regardless of the race is suggested.

Table 1

Average of longevity of different races, in all colonies, in each experiment, in different periods of the year

Experiment No.	Experimental period	Assured age in days of the oldest bees					Average survived ages in days of all bees				
		Italian	Caucasian	Carniolan	Golden	average of all races	Italian	Caucasian	Carniolan	Golden	average of all races
I A + B	5/6 - 7/6/50	43.2	48.6	53.2		48.33	24.40	27.60	29.30		27.10
II A + B	6/22 - 8/18/50	42.0	46.8	50.4		46.40	17.99	23.47	26.35		22.60
III A + B	7/10 - 9/14/50	48.0	56.5	60.0		54.83	23.31	26.87	30.90		27.03
IV * A	8/2 - 10/25/50	54.0	59.0	66.0		59.66	19.83	21.93	23.78		21.85
* B		68.0	72.0	75.0		71.66	32.04	34.68	38.51		35.07
A + B		62.5	66.5	71.5		66.87	27.16	30.08	32.62		29.95
V A	9/9/50- 5/14/51	146.0	130.5	127.0		134.50	37.65	36.20	34.47		36.11
B		241.0	232.0	213.0		228.66	139.78	101.44	72.97		104.73
VI A	10/10/50- 6/ 7/51	195.0	163.0	140.0	139.0	159.25	58.79	47.35	36.08	37.28	44.88
B		231.0	213.5	198.5	206.0	212.25	92.11	81.03	59.77	66.89	74.95
VII A + B	9/29/50- 6/ 1/51	240.0	224.5	214.0	210.0	222.25	96.35	85.35	82.23	75.61	84.89
VIII A + B	4/15 - 6/27/51	54.2	56.8	61.0	62.2	58.5	26.49	27.56	29.45	32.58	29.27
IX A + B	5/20 - 7/21/51	46.5	52.0	53.0	56.0	52.0	21.34	22.98	25.19	26.86	24.09
X A + B	6/21 - 8/30/51	51.5	56.5	59.0	61.5	57.25	19.38	21.61	22.90	25.90	22.45
* A	7/24 - 10/26/51	51.6	54.0	55.5	62.0	55.62	17.88	19.92	21.62	26.57	21.53
XI * B		68.5	74.5	84.25	89.0	79.06	21.52	26.03	29.17	32.93	27.42
A + B		62.6	67.6	74.6	80.0	71.25	20.31	23.99	26.65	30.81	25.44

A Average of the observation hives,
B Average of the full colonies

Honeyflow: June 22 - July 24, 1950
June 2 - July 30, 1951

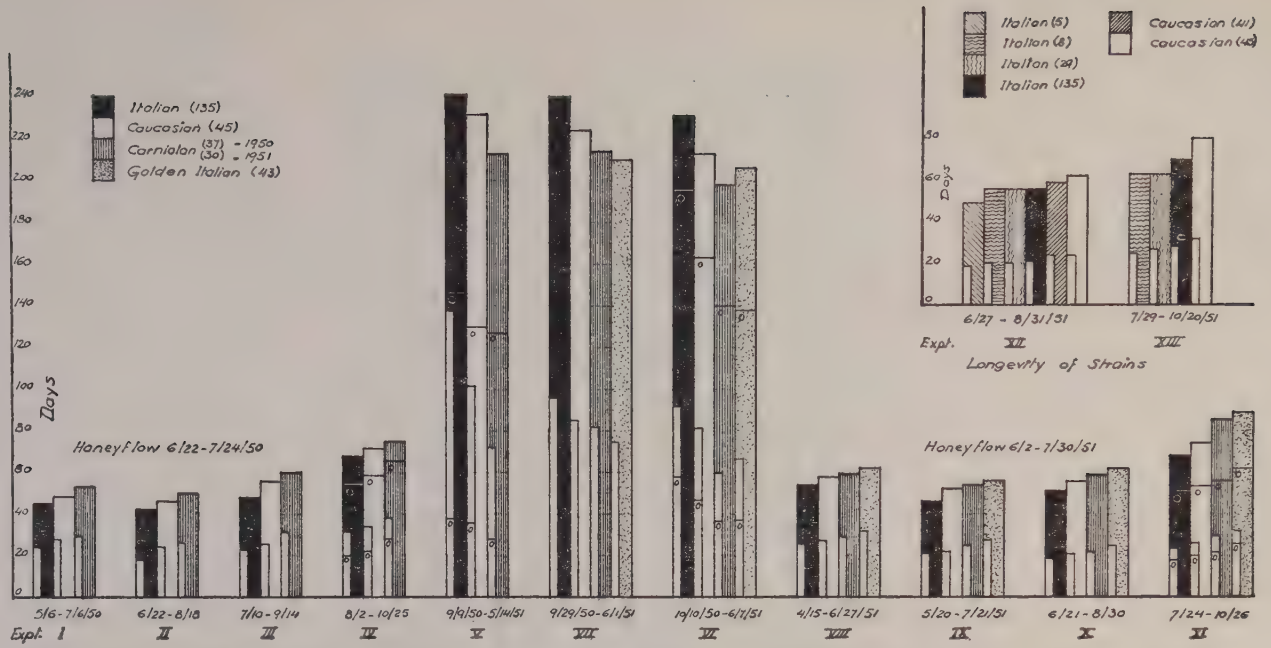

Figure 1. Average of longevity of different races in all colonies, in each experiment, in different periods of the year.

1. The main upright bars indicate the average of the assured age of the oldest marked bees of each race in all colonies.

2. The small bars, on the inside to the left of the main bars, indicate the average of the survived age of all marked bees of each race in all colonies.

3. 0 indicates the same information as in 1 and 2 for the two observation hives, separately from the full colonies when large differences were found between them. In all other cases, the observation hives and the full colonies were averaged together.

VITA

Abdel-latif Amin El-Deeb was born on September 3, 1912, at El-Roubdan, County Shoubrakhit, Province Behera, Egypt. After graduating from Ras-el-tin High School, Alexandria, Egypt, in 1933, he entered the Fouad I University, Cairo, Egypt, and received the degree of Bachelor of Science from that institution in June 1937. He worked as an Assistant in the same institution until October 1942, after which he was chosen to work in the Department of Entomology in Farouk I University, Alexandria, Egypt, when it was first started in 1942. In 1944, he was promoted to Associate, and in 1948 to Apiculurist. He was granted a study leave in August 1949 to complete his studies in the United States of America, where he entered the Graduate College of the University of Illinois. He received the degree of Master of Science in February 1951. He is a member of Fouad I Society of Entomology, Cairo, Egypt, and of Phi Kappa Epsilon of the University of Illinois.